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NIT-392

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

K. MOGI et al.

Serial No. 10/646,699 Group Art Unit: 2186

Filed: August 25, 2003

For: CACHE MANAGEMENT METHOD FOR STORAGE DEVICE

PETITION TO MAKE SPECIAL
UNDER 37 CFR §1.102(d) (MPEP §708.02(VIII))

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450 August 27, 2004

Sir:

The Applicants petition the Commissioner to make the above-identified application special in accordance with 37 CFR §1.102(d).

In accordance with the requirements set forth in Manual of Patent Examining Procedure §708.02(VIII), the Applicants believe that all claims are directed to a single invention. If the Office determines that all claims are not directed to a single invention, Applicant will make an election without traverse as a prerequisite to the grant of special status.

Further, a pre-examination search has been conducted in the following areas: Class 711, subclasses 119, 129, and 136,

and 173. A key word search was also performed on the USPTO system EAST.

Of the documents reviewed during the search, those deemed to be most closely related to the subject matter encompassed by the claims are listed below. The claimed subject matter is believed to be patentable over the teachings of these documents for the reasons set forth. One copy of each of these documents accompanies this Petition.

Documents developed by the pre-examination search

U.S. Patents

4,947,319	Bozman
5,537,635	Douglas
5,566,315	Milillo et al.
5,675,797	Chung et al.
5,717,893	Mattson
6,061,763	Rubin et al.
6,421,761	Arimilli et al.
6,470,423	Ho et al.

Bozman, US 4,947,319 ("Bozman") discloses a dynamic data cache whose size is dynamically changed in response to competing demands for processor storage. An arbiter cyclically determines the appropriate size of the cache based on the number of users awaiting a resource and the number of cache hits, to determine whether the maximum allowable cache

size should be expanded or reduced. The cache, which may use real or expanded storage, is thus increased or decreased in size, but by no more than a fraction g of the maximum size allowable, wherein the value g is typically between 5% and 10% of the maximum allowable cache size. A decision about increasing or decreasing the data cache is not based on process details and data mapping, and thus Bozman does not disclose the means for acquiring information about process details and data mapping, the means for creating planned cache space settings using the acquired information, or the means for directing the storage device to activate cache space settings according to the planned cache space settings, as required by independent claims 1 and 13. Furthermore, Bozman is not directed to a method for managing a data cache in accordance with rerun processing as set forth in independent claim 14; a method for managing a data cache based on a specified cache effect function as set forth in independent claim 16, or a method for optimum caching management based on wait frequency and a length of execution time, so as to enhance the cache hit rate and thereby shorten the execution time of the process; as set forth in independent claim 22.

Douglas, US 5,537,635 ("Douglas") discloses a method and system for dynamically changing the relative sizes of cache partitions, including maintaining a virtual minimum partition size. According to the method, a target size for each partition is periodically determined, and a reclaim vector is assigned to each partition specifying the number of frames to be stolen from each other partition to achieve the corresponding target size. If the target size of a particular partition is less than the partition's virtual minimum size, the reclaim vector for that partition is adjusted to enable the partition to steal sufficient frames from other partitions to achieve the virtual minimum size. Bozman does not disclose that the partition size is set in accordance with process details and, data mapping, as required by independent claims 1 and 13. Further, Bozman does not disclose that the method of partition cache resizing is based on rerun processing as required claim 14, based on a cache effect function as required by claim 16, or based on wait frequency to enhance the cache hit rate of the data to be accessed during process execution, as required by claim 22.

Milillo, US 5,566,315 ("Milillo") discloses a process of predicting and controlling the size of a cache memory space by

adjusting low and high thresholds to release or cease the release of more free cache space, respectively. The low and high thresholds are predicted on the number of allocations (hits) in response to I/O requests, and based on the number of blockages (misses) which occur when an allocation cannot be accomplished. The predictions may be based on weighted values of different time periods, such that only a predicted amount of cache memory space is freed. Milillo does not disclose that cache space settings are created and implemented based on process details and data mapping, as required by claims 1 and 13, or based on rerun processing (claim 14), a cache effect function (claim 16), or wait frequency so as to enhance the cache hit rate during process execution (claim 22).

Chung et al., US 5,675,797 ("Chung") discloses a resource allocation manager for dynamically managing and adjusting buffer pools within a computer system. Chung dynamically adjusts buffer pool sizes to minimize the "maximum performance index" of the system and to balance the performance index values among all buffer pools within the system. A "maximum performance index" is found for a "maximum server" by calculating, for each of the plurality of servers in the computer system, the size value of the server plus a

predefined number of resources to be exchanged. Chung does not disclose that cache space settings are created based upon process details and data mapping as required by claims 1 and 13, based on rerun processing as required by claim 14, based on a cache effect function as required by claim 16, or based on wait frequency so as to enhance the cache hit rate as required by claim 22.

Mattson, US 5,717,893 ("Mattson") discloses a method for managing a cache hierarchy having a fixed total storage capacity. The cache hierarchy is logically partitioned to form a least recently used (LRU) global cache and a plurality of LRU destaging local caches bound to respective objects having a unique DataType. Data not available in the global cache is staged to the global from one of the local caches or from external storage. The parameters defining the partitions are externally supplied. Some of the local caches (or sub caches) are implemented for storage of data records of specific data types, thus allowing some DataTypes to remain in the cache longer than other DataTypes. The partition sizes can be periodically reconfigured to achieve higher hit ratios by altering a single data structure accessed by a single cache manager without moving or altering any data actually stored in

the cache, except for the possibility of pushing some data out of the cache. According to column 7, lines 49-55, the size of each partition is determined by an analysis process external to the disclosure of Mattson, whereby the partitioning decided so as to produce equal or higher hit ratios than that which was known to the prior art. Therefore, Mattson does not disclose that cache space settings are created based on process details and data mapping as required by claims 1 and 13, based on rerun processing as required by claim 14, based on a cache effect function as set forth in claim 16, or based on wait frequency as required by claim 22.

Rubin et al., US 6,061,763 ("Rubin") discloses a memory management system in which a computer memory is partitioned into a plurality of buffer caches, each of which is separately addressable. One buffer cache is set aside as a default buffer cache, while the other buffer caches are reserved for specific data objects meeting certain predefined criteria. The predefined criteria may be any of possible limitations specified by a user or system developer, such as subject matter. Further, each individual buffer cache can be partitioned by the user into multiple memory pools which can be resized to accommodate demand. Although data is allocated

to a buffer cache based on the predefined criteria, and to memory pools based on size, Rubin does not teach that the cache space settings are created based on process details and data mapping as required by claim 1 and 13, based on rerun processing as required by claim 14, based on cache effect function as set forth in claim 16, or based on wait frequency as required by claim 22.

Arimilli et al., US 6,421,761 ("Arimilli") discloses a partitioned cache and management method for selectively caching data by type, such as operating system routine and data used by the routines. There appears to be no disclosure that the method changes cache size dynamically.

Ho et al., US 6,470,423 ("Ho") discloses cache partition managing methods for dynamically selecting buffers in a buffer cache to store data items based on data access and/or usage patterns. A buffer cache includes multiple buffer pools, which may be selected to store data items based on various factors, including the likelihood of future cache hits, and properties of buffer pools that vary among the buffer pools. These properties include buffer pool size, size of a buffer in the buffer pool, and replacement strategy used for a buffer

pool. Further, selection of a particular buffer pool may be based upon a hint perimeter which identifies a particular reason for associating a particular object with a requested data item. As set forth in column 11 of the patent, the buffer pools can be dynamically resized by moving buffers from one pool to another. However, the patent does not disclose criteria for resizing the buffer pools. Thus, there is no teaching for creating cache space settings based on processed details and data mapping as required by claims 1 and 13, based on rerun processing as required by claim 14, based on cache effect function as required by claim 16, or based on wait frequency as required by claim 22.

Conclusion

The Applicants submit that the foregoing discussion demonstrates the patentability of the claimed invention over the closest known prior art. Accordingly, the requirements of 37 CFR §1.102(d) and MPEP §708.02 (VIII) having been satisfied, the Applicants request that this Petition be granted and that the application be examined according to prescribed procedures.

The Applicants prepared this Petition in order to satisfy the requirements of 37 C.F.R. §1.102(d) and MPEP §708.02 (VIII). The pre-examination search required by these sections "must be directed to the invention as claimed in the application for which special status is requested." MPEP §708.02 (VIII). The search performed in support of this Petition is believed to be reasonable; however, the Applicants make no representation that the search covered every search area that may contain relevant prior art. Prior art of greater relevance to the claims may exist. The Applicants urge the Examiner to conduct his or her own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited above and any other prior art that may be located in the Examiner's independent search. Further, while the Applicants have identified certain portions of each cited reference in order to satisfy the requirement for a "detailed discussion of the references, which discussion points out, with the particularly required by 37 C.F.R. §1.111(b) and (c), how the claimed subject matter is patentable over the references" (MPEP §708.02) (VIII), the Examiner should not limit review of these documents to the identified portions, but rather it is urged to review and consider the entirety of each reference.

A Credit Card Payment Form in the amount of $130.00 accompanies this Petition in satisfaction of the fee set forth in 37 CFR §1.17(h). The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

Respectfully submitted,

Daniel J. Stanger
Registration No. 32,846
Attorney for Applicants

MATTINGLY, STANGER & MALUR, P.C.
1800 Diagonal Rd., Suite 370
Alexandria, Virginia 22314
(703) 684-1120
Date: August 27, 2004